

DOE Research Aircraft Facility



Gulfstream 159 (G-1)

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Battelle

U.S. Department of Energy
Pacific Northwest National Laboratory

DOE Research Aircraft Facility

- A DOE/OS/ESD resource for atmospheric research
- Instrument development, testing, and application
- Extensive field study utilization
- Up to 250 flight hours per year
- Requests for access reviewed and recommended by Advisory Panel

Attributes of the G-1 Research Aircraft



- Dimensions: Length 19 m
Wingspan 24 m, Height 7.1 m
Weight 16,330 kg max
- Altitude 0.5-7.5 km
- Cruise speed 80-200 m/s
- Sampling speed 100 m/s
- Climb 330 m/min max
- Endurance with maximum fuel: 6 hr
- Power: 4,000 VA @ 115 VAC
4,000 VA @ 230 VAC
- Crew: 2 pilots, 1-4 scientists
- Cabin payload: 1,300 kg

Status of G-1

- Minor corrosion damage repaired at Priester
- Right propeller overhauled (Battelle)
- HP cock lever plate upgraded to prevent inadvertent fuel shut off
- APU blower pulley bearing replaced
- Inspection/preventive maintenance up-to-date
- Two new copilots completed initial training at FSI and are undergoing additional training at PNNL
 - Tony Robinson
 - Bill Svancara

Future G-1 Activities

- Remove engine vacuum ejectors
- PIC certification for Dick Hone
- Add right wing-root downward ports and pressure vessel signal and power feed-through
- Modernize research power distribution system
 - phase synchronized inverters
 - 110 / 220 VAC load matching flexibility
 - repackaging, relocate power distribution system
- Overhaul or replace left engine (Battelle)

FY 2001 Schedule for G-1

- Priester maintenance 11/29/00 – 01/19/01
 - NAOPEX testing 03/01/01 – 05/30/01 (sporadic)
 - Phoenix-01 06/07/01 – 07/03/01
 - PNW2001 08/15/01 – 09/10/01
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- Inclusive dates are for actual field deployment and do not include instrument installation or removal or on-going on-site preparation and maintenance activities.

Schedule for G-1 in FY 2001

2001	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
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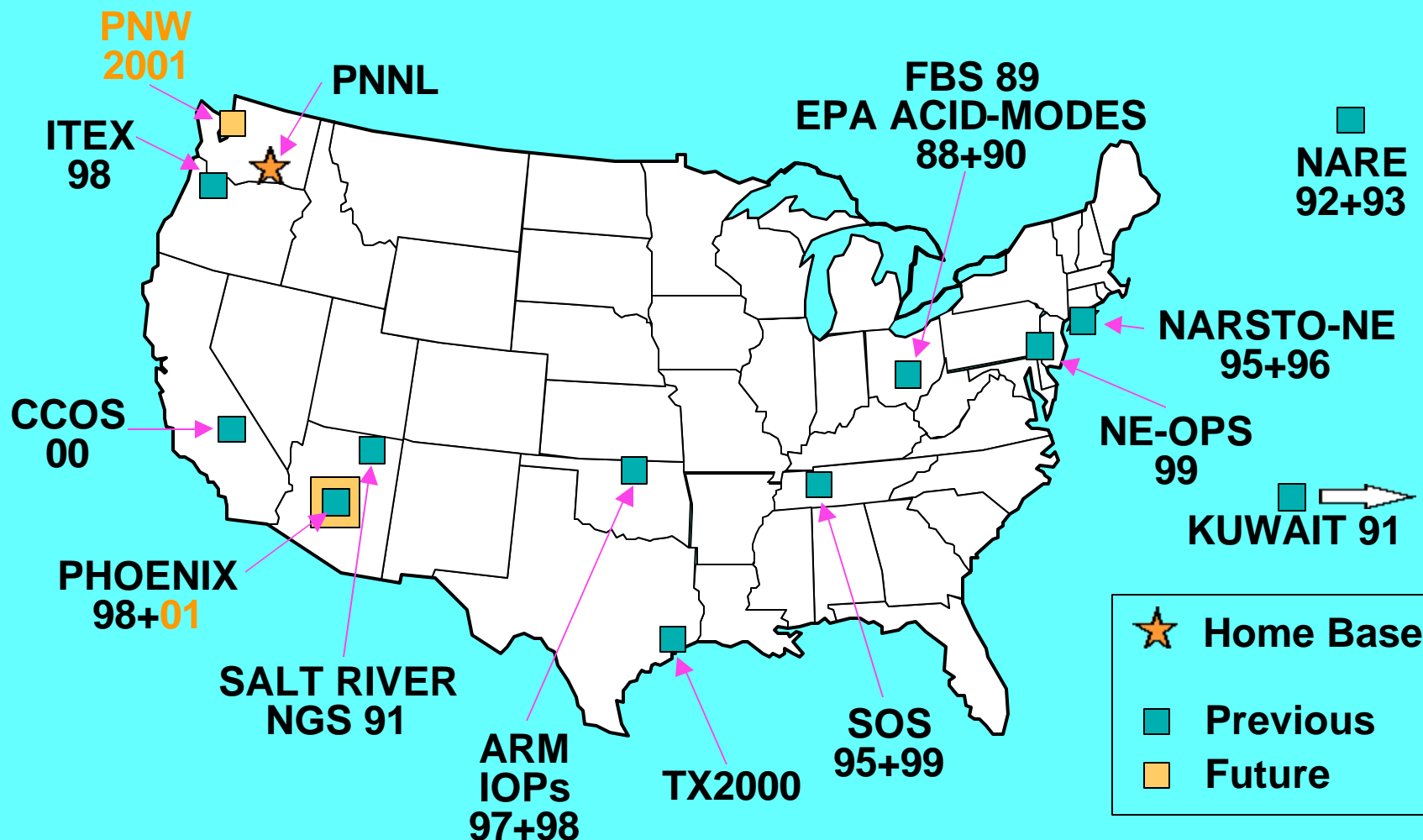
Maintenance at Priester

Project preparation

Crew training at FSI

Project action

Locations of Projects Using the DOE RAF G-1



Future Field Activities for G-1

- NAOPEX FY 2002
- TAP/ACP FY 2002
- Northeast Regional FY 2003
- Puerto Rico FY 2003
- NETL collaborative activity

Status of G-1 Instrumentation: Particles

Measurement	Instrument	Owner	Status
Size distribution	PMS FSSP	PNNL	Active
Size distribution	PMS PCASP-100X	PNNL	Active
Drop/crystal size	PMS OAP-2D	PNNL	Available
Liquid water content	King KLWC-5	PNNL	Active
Liquid water content, effective drop radius	Gerber PVM-100A	PNNL	Active
Aerosol light scattering (bscat+total scat)	TSI 3563 3- σ integrating nephelometer	PNNL	Active
Aerosol light absorption	Radiance PSAP	PNNL	Active
Condensation particle concentration	TSI 3010 (>7 nm)	PNNL	Active
Ultrafine particle concentration	TSI 3025A (>3 nm)	PNNL	Active
Aerosol size distributions	BNL TSEMS	BNL	Active
Particle ionic composition	Particle Into Liquid System	BNL	Active

Status of G-1 Instrumentation: Gases

Measurement	Instrument	Owner	Status
SO ₂	TECO 43S pulsed fluorescence (fast response)	PNNL & BNL	Active
O ₃	TECO 49 UV absorption	PNNL & BNL	Active
CO	TECO 48 IR absorption-gas filter correlation	PNNL & BNL	Active
CO	BNL TUV CO	BNL	Testing
NO/NO _x /NO _y	3-channel NO/NO _x /NO _y	BNL	Active
NO ₂ /PAN	GC/Luminol system	ANL	Active
HCHO		BCO	Available
Trace gases	TAGA mass spectrometer	BCO	Active
Trace gases	API-365 mass spectrometer	BCO	Active
H ₂ O ₂ /RHO ₂	3-channel Peroxide System	BNL	Active

Status of G-1 Instrumentation: Time-Integrated

Measurement	Instrument	Owner	Status
PAN	GC/ECD	BCO	Active
VOC	Canister sampling system	ANL	Active
VOC	VOC-GC	ANL	Testing
HCHO+Carbonyls	HPLC Sampling System	BNL	Active

Status of G-1 Instrumentation: Radiation

Measurement	Instrument	Owner	Status
UV irradiance	Eppley radiometer	PNNL	Active
Surface/Sky IR temperature	PRT-5 Pyranometer	PNNL	Active
Short-wave irradiance	Eppley pyranometer	PNNL	Active
Long-wave irradiance	Eppley pyrgeometer	PNNL	Active
Spectral radiation	7-channel, multi-filter radiometer	PNNL	Active

Status of G-1 Instrumentation: Meteorology

Measurement	Instrument	Owner	Status
Temperature	Rosemount E102AL/510BF platinum resistance	PNNL	Active
Dew-point temperature	General Eastern 1011B cooled mirror	PNNL	Active
Absolute humidity	AIR Lyman-Alpha hygrometer	PNNL	Obsolete
Pressure	Rosemount 1201F1 absolute pressure transducer	PNNL	Active
Vector winds (gust probe)	Rosemount differential pressure/ differential GPS	PNNL	Active

Requests for DOE RAF Use

- User submits form requesting flight time and giving detailed information on deployment schedule, flight patterns, instrumentation and data needs
- A review panel evaluates user requests
- DOE authorizes flight time; PNNL coordinates use
- Priority given to DOE/OS/ESD projects
- Contact W. R. Barchet for more information or application for flight hours:
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